Does season of burn influence fuel life cycle and fire behavior in longleaf pine flatwoods of the southeastern US?

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Overview

- Background
- Hypothesis
- Methods
- Results
- Conclusions
- Further analysis

Background: fuel treatments

Prescribed fire, St. Marks National Wildlife Refuge, Florida. J. Cronan, 2010.

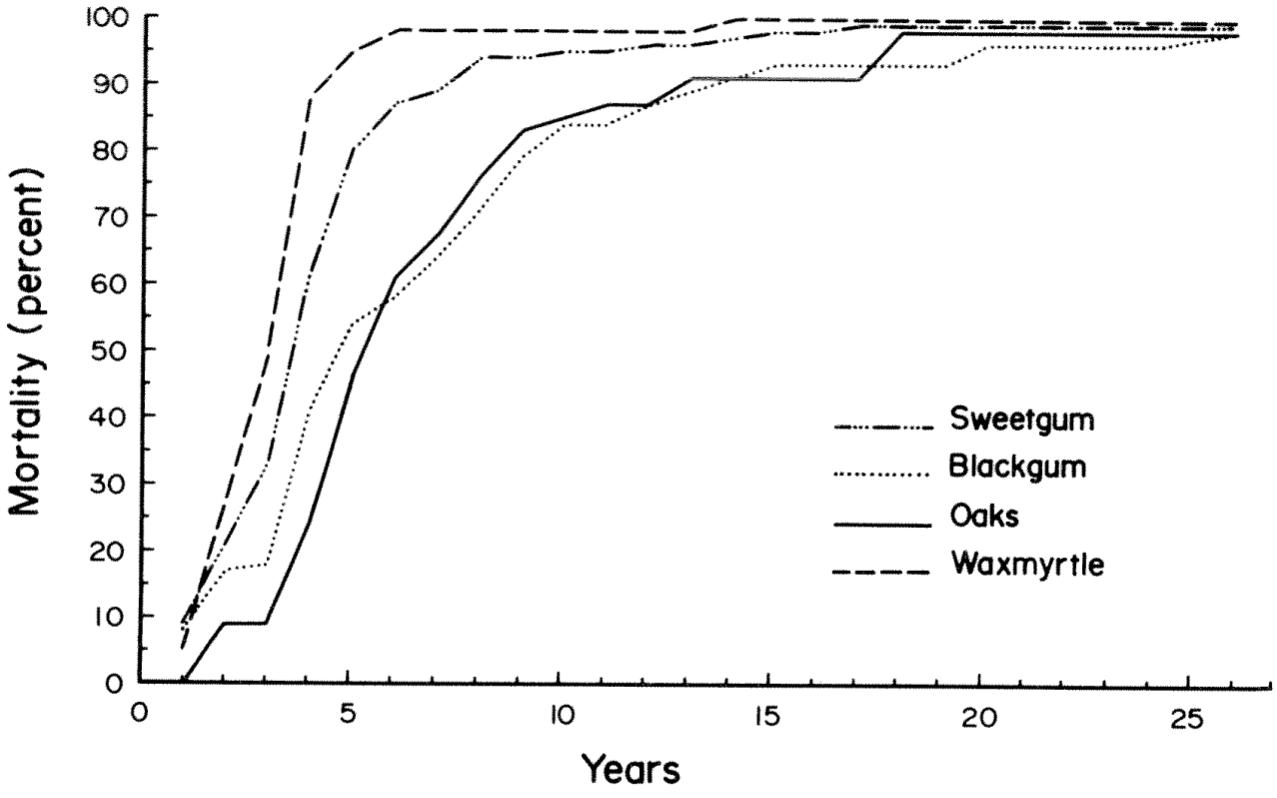
Background: the longleaf pine ecosystem

Longleaf pine flatwoods. Apalachicola National Forest, Florida. J. Cronan, 2012.

Background: reference conditions

Pre-fire suppression flatwoods, southern Florida. John K Small, 1928.

Background: reference conditions



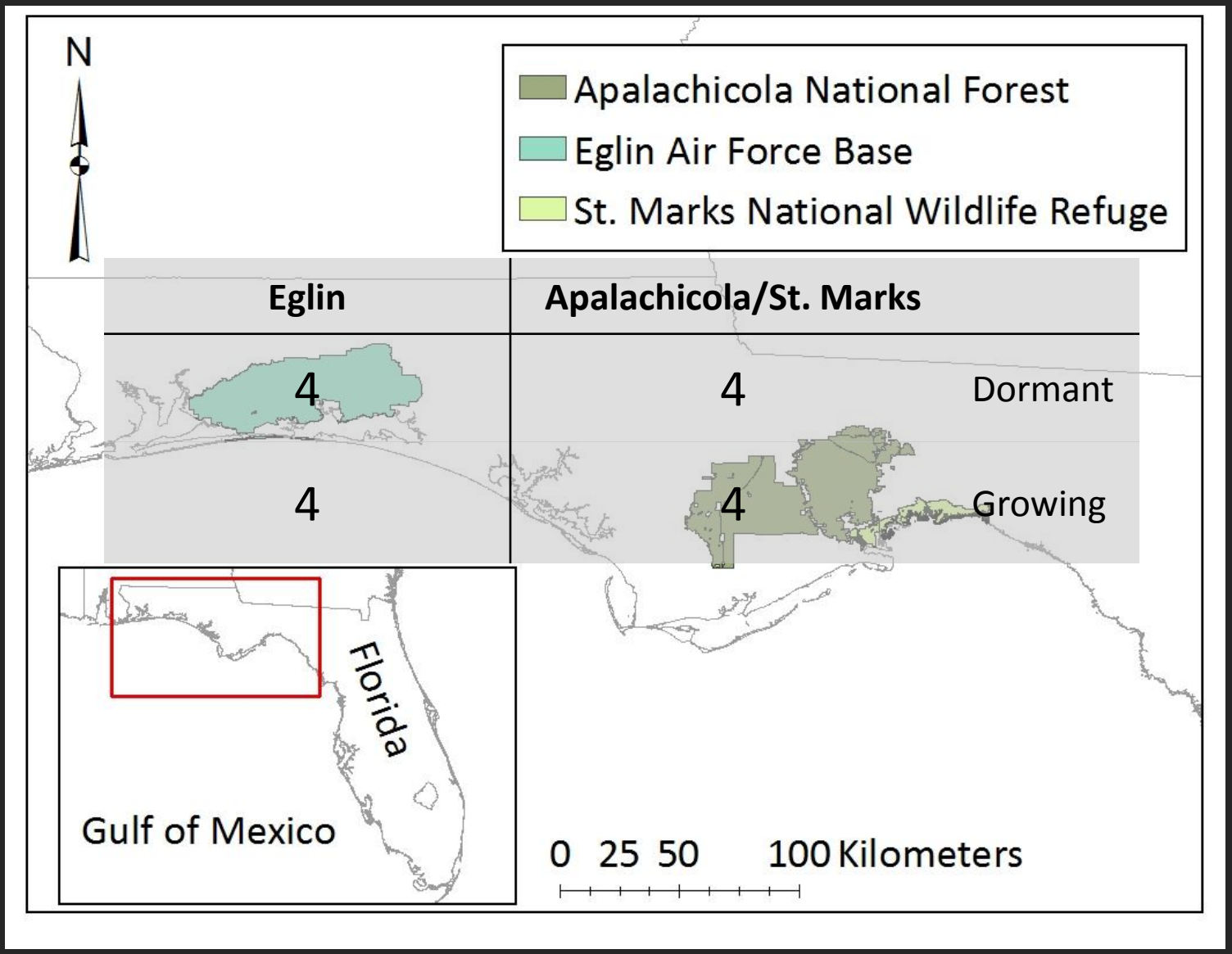
A. Annual Summer Burn

Waldrop et al. 1987

Hypotheses

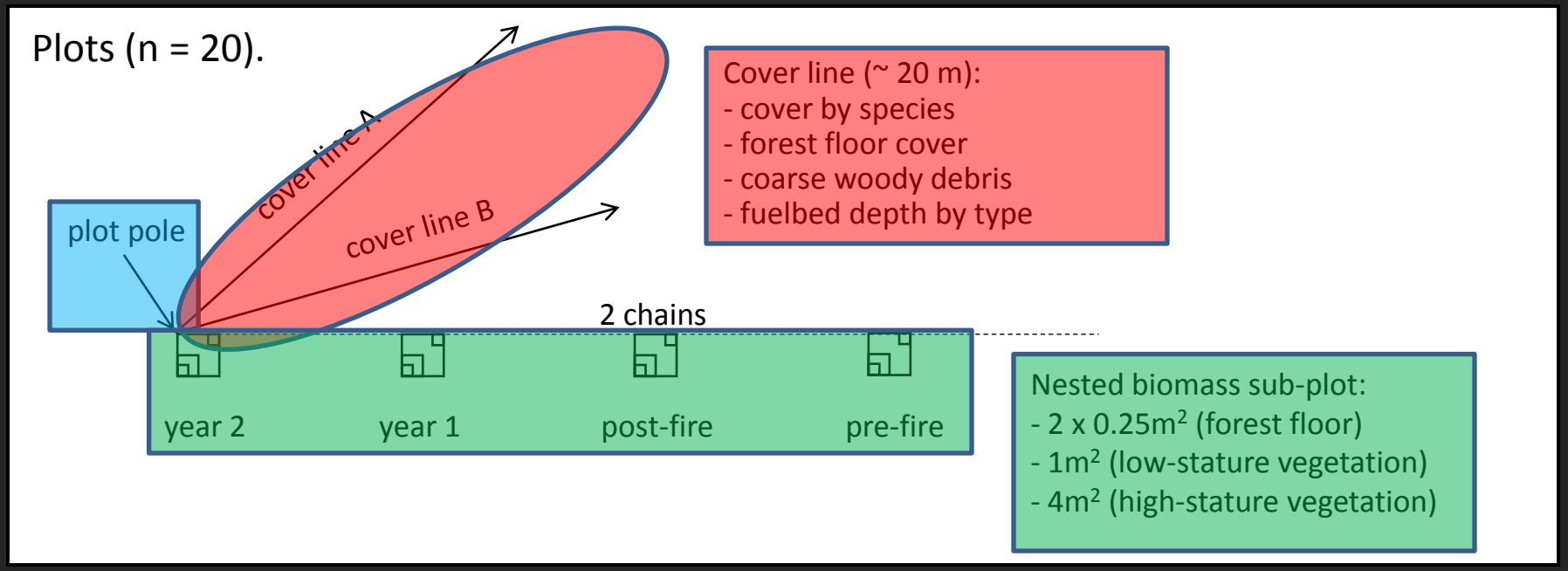
- H_1: Postfire regeneration of herbaceous biomass is not equal between treatments.
- H_2: Postfire regeneration of woody biomass is not equal between treatments.
- H_3: Fire behavior (i.e. rate of spread, flame length, and reaction intensity) is not equal between treatments.

Methods: study area

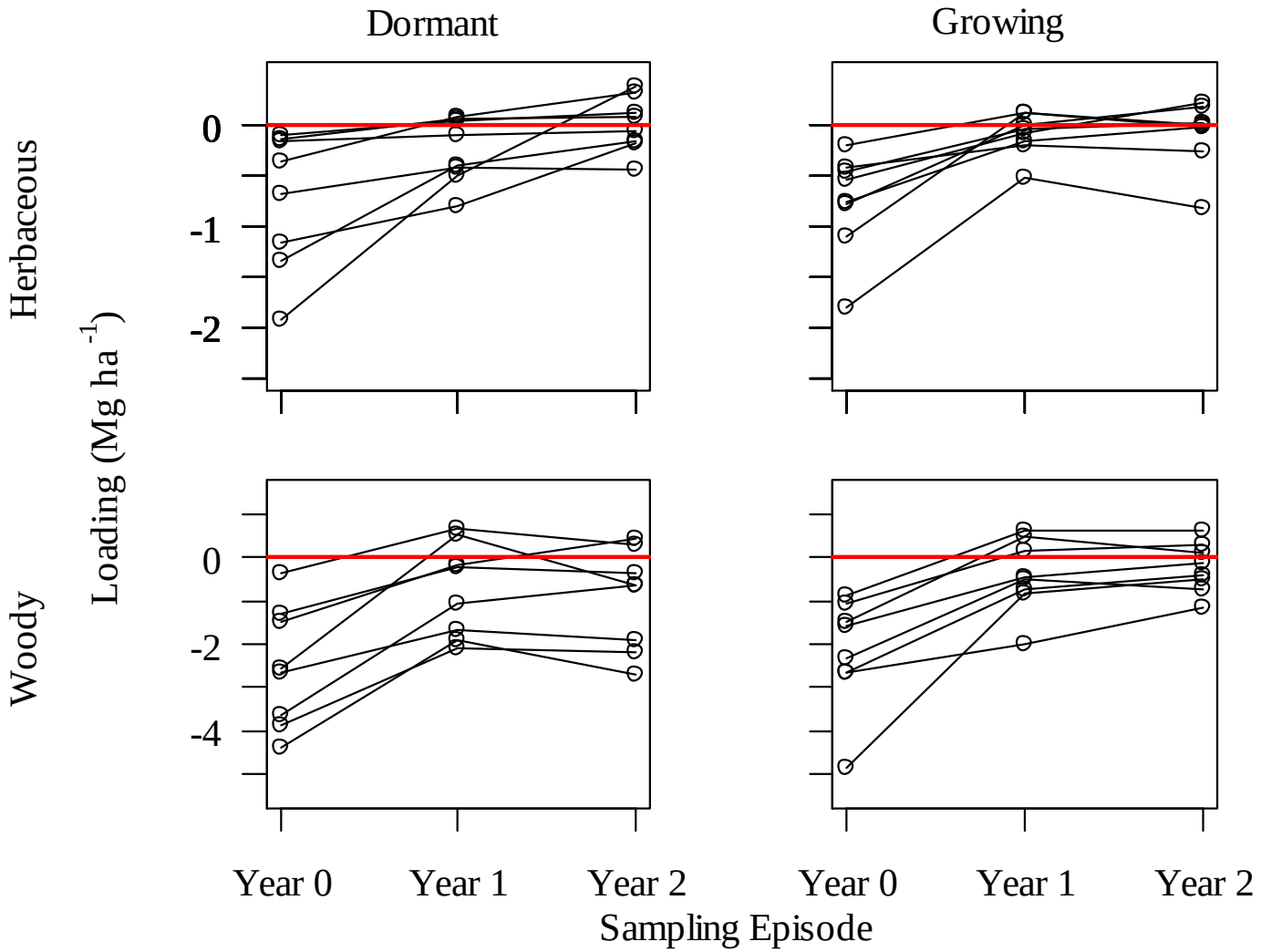


Methods: sampling design

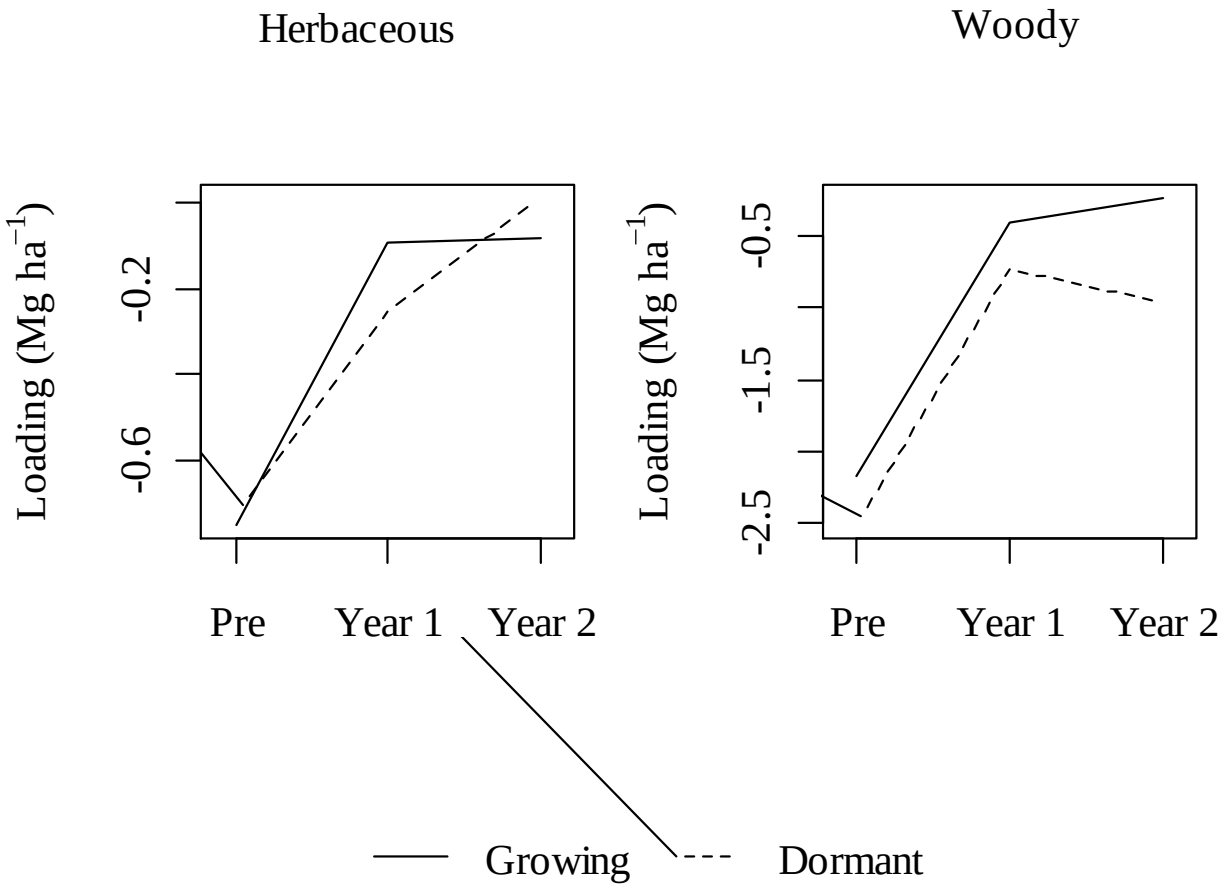
- Systematic plot layout fit to natural stand boundaries
- Fuel measures necessary to develop FCCS fuelbed.



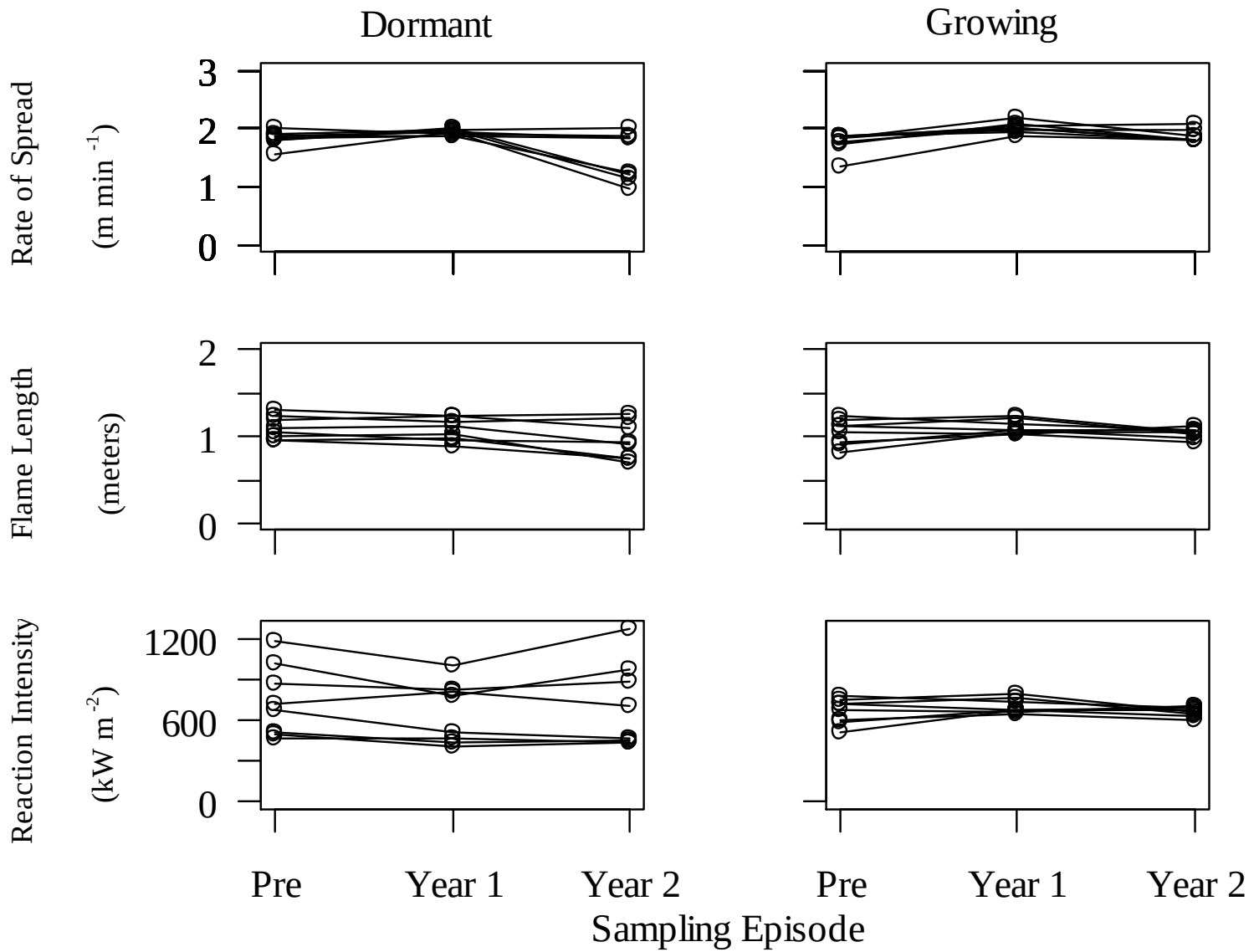
Results: understory vegetation – departure from prefire loading



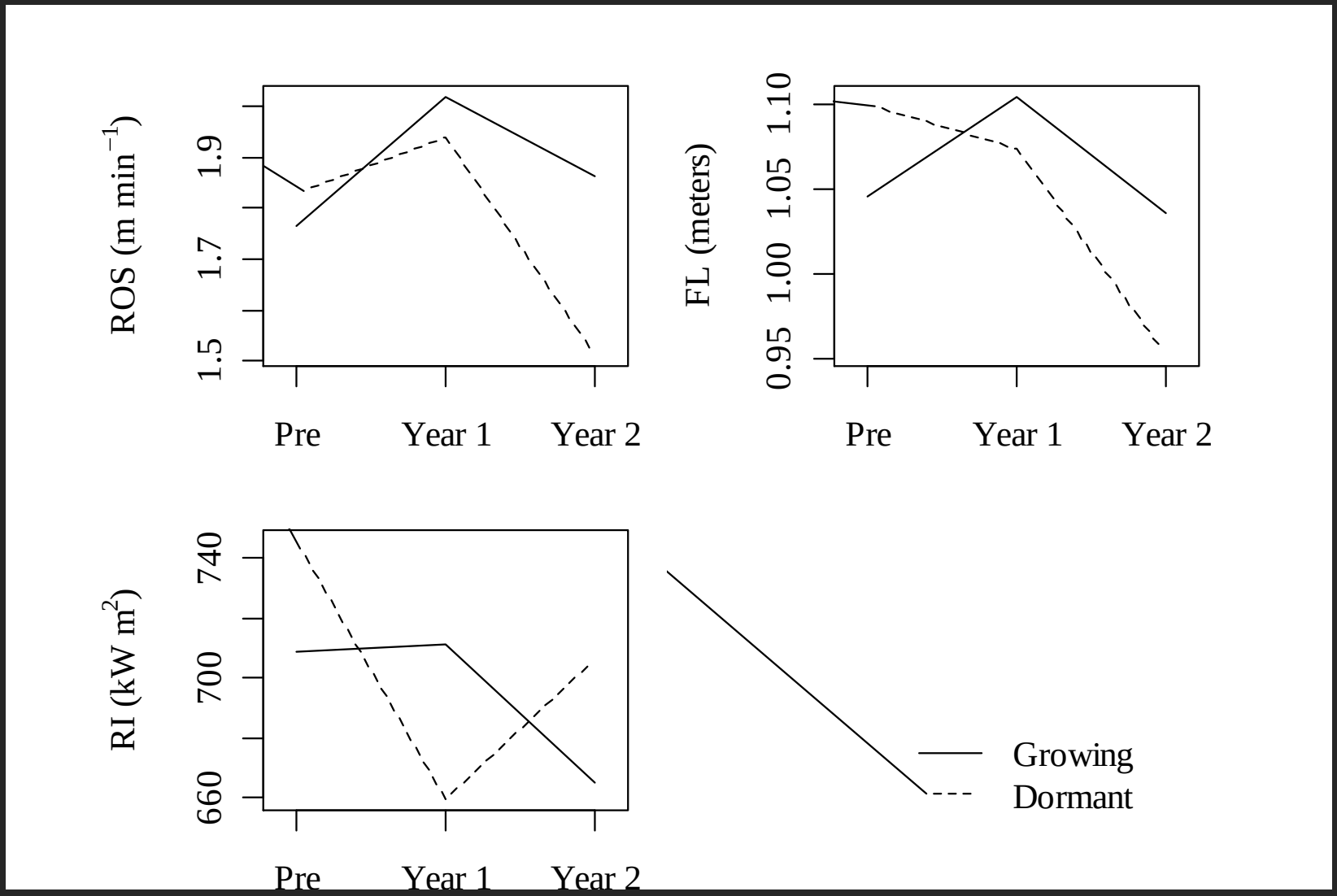
Results: Vegetation interaction plots



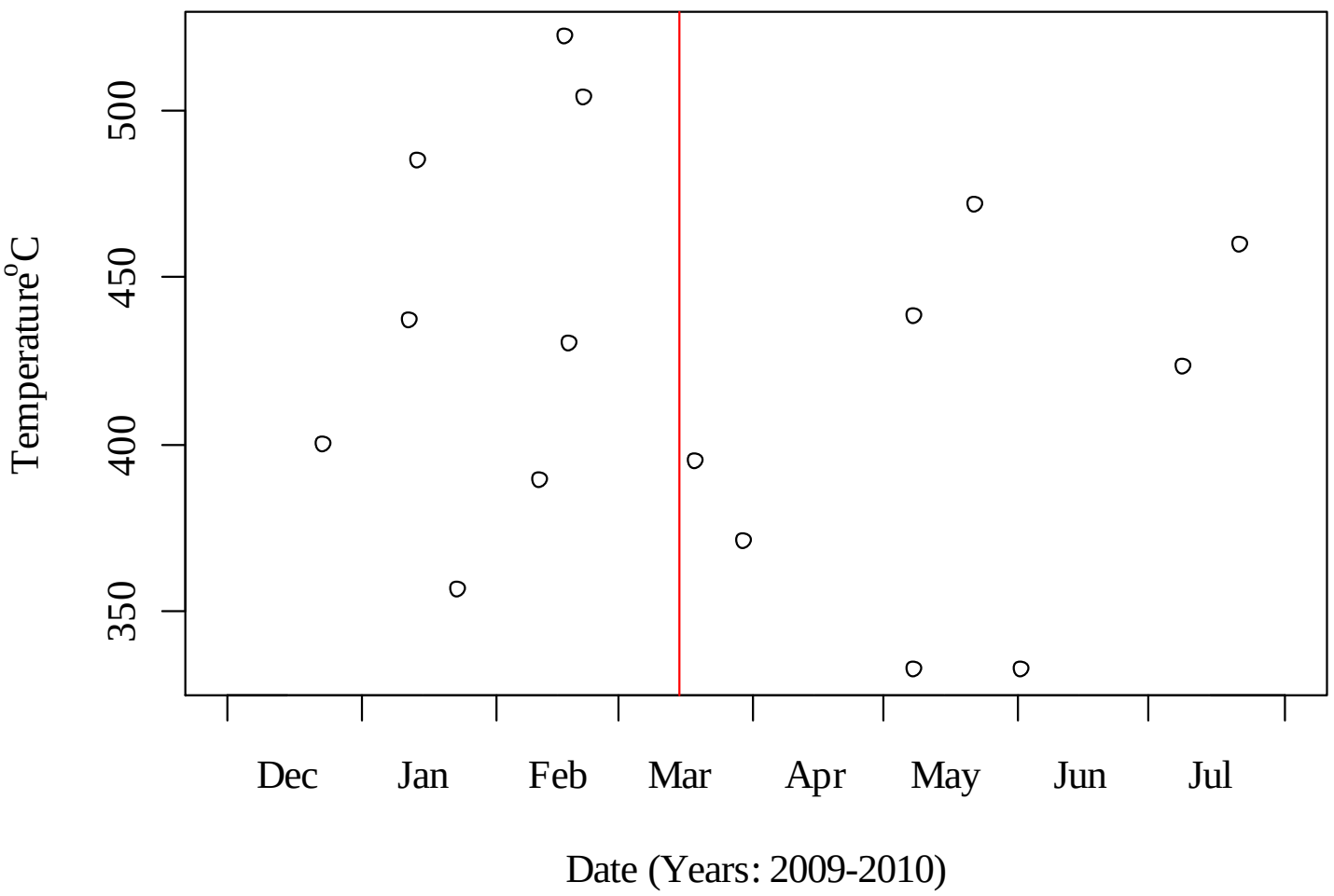
Results: FCCS fire behavior outputs



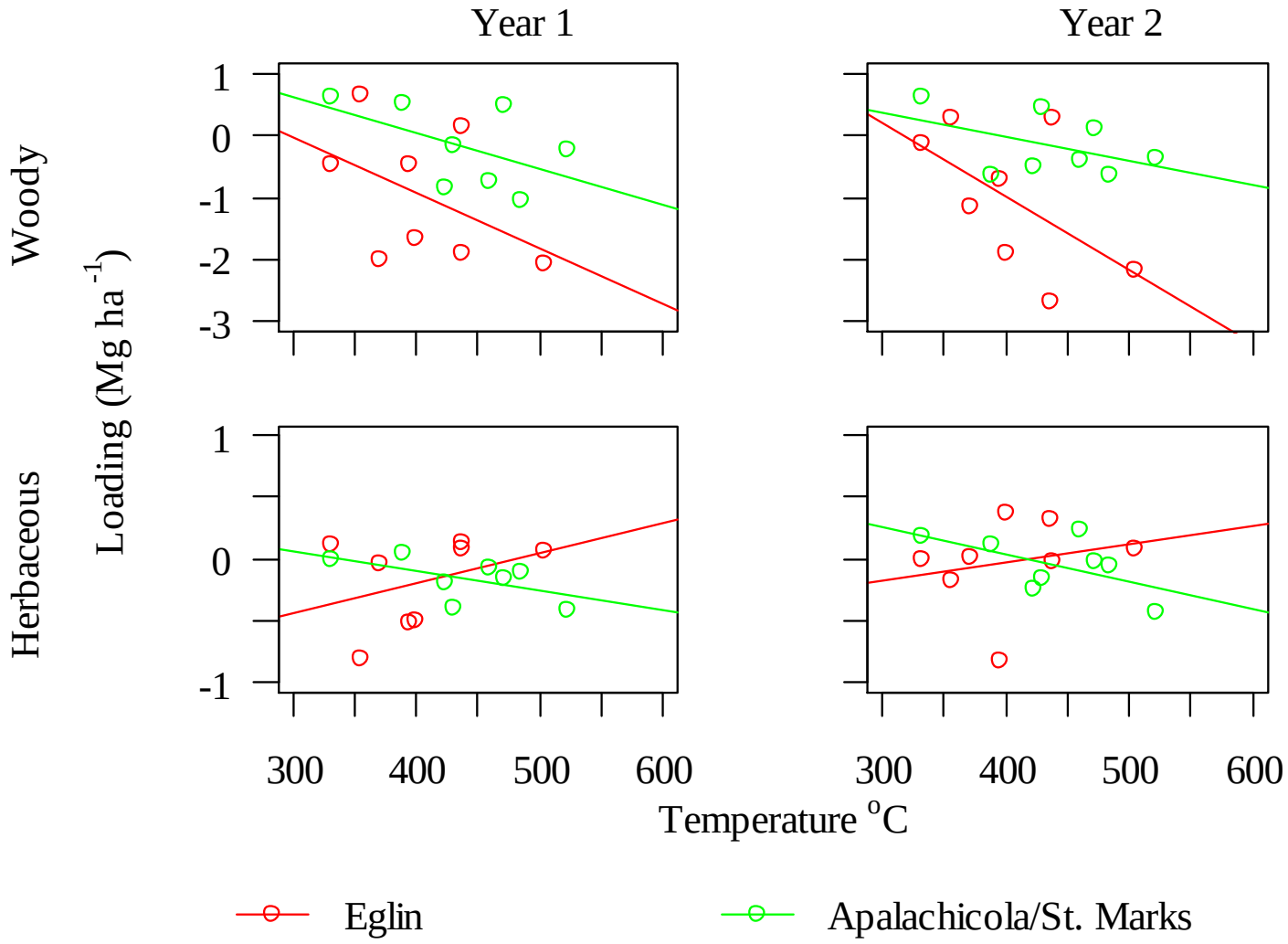
Results: FCCS output interaction plots



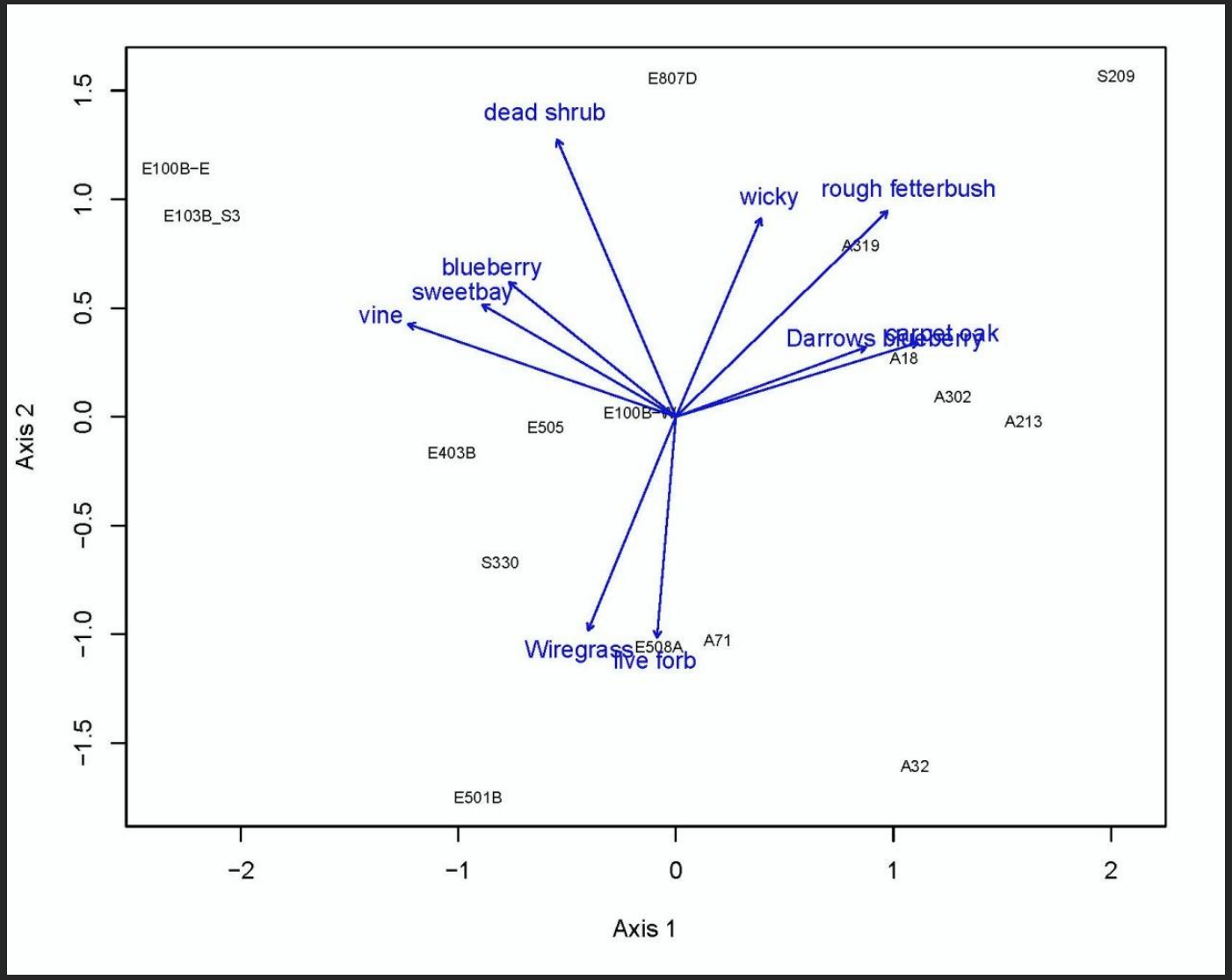
Results: mean peak fire temperature by site and burn date



Results: departure from prefire loading distribution by season and region



Results: NMDS plot, more mesic species at Eglin?



Conclusions

- Fail to reject null hypotheses. No effect of season on live fuel loading or predicted fire behavior.
- Mildly significant interaction between season and sampling episode.
- Inverse relationship between temperature and shrub regeneration.

Apalachicola National Forest, Florida.
J. Cronan, 2012.

Further Analysis

- Quantify relationship between burn temperature profiles and vegetation response.
- Impact of short-term (1990-2010) fire history and other ecological drivers.

Apalachicola National Forest, Florida. J. Cronan, 2010.

Acknowledgements

•Committee members

Ernesto Alvarado, Clint Wright, John Skalski, Morgan Varner, Mark Kot

• Pacific Wildland Fire Sciences Lab

Maria Petrova , Jon Dvorak, Jon McDuffey, Travis Freed, Cameron Balog, Aarin Sengsirirak, Paige Eagle, Bob Vihnanek, and Maureen Kennedy

• Funding provided by:

• Supporting organizations

Eglin AFB: J. Kevin Hiers and Brett Williams.

Apalachicola NF: Eugene Watkins.

St. Marks NWR: Jennifer Hinckley and Gregory Titus.

Prescribed fire, Apalachicola National Forest, Florida. J. Cronan, 2010.

Eglin Air Force Base, Florida. J. Cronan, 2009.

Results: rANOVA for vegetation

Herbaceous

	SS	df	SS_{error}	df	F statistic	P
Season	0.0023	1	1.5748	7	0.0101	0.92283
Episode	4.4779	2	1.0871	14	28.8340	0***
Season:Episode	0.1403	2	1.7616	14	0.5577	0.58476

Woody

Season	2.641	1	20.677	7	0.8942	0.37585
Episode	33.399	2	7.187	14	32.5293	0***
Season:Episode	0.424	2	1.796	14	1.6542	0.22652

Significance codes: '***' < 0.001, '**' < 0.01, '*' < 0.05, '.' < 0.1.

- Bartlett's test for constant variance.
- Residuals normally distributed (Shapiro-Wilkes Normality test).

Results: rANOVA for FCCS outputs

Rate of Spread

	SS	df	SS_{error}	df	F	P
Season	0.177	1	0.597	7	2.0766	0.192764
Episode	0.689	2	0.449	14	10.7326	0.001494**
Season:Episode	0.358	2	0.433	14	5.7896	0.01712*
Flame Length						
Season	0.005	1	3.93	7	0.0855	0.778479
Episode	0.083	2	0.088	14	6.5464	0.009838**
Season:Episode	0.039	2	0.073	14	3.7340	0.050159.
Reaction Intensity						
Season	945	1	1045847	7	0.0063	0.9388
Episode	18517	2	118813	14	1.0909	0.3628
Season:Episode	22072	2	103062	14	1.4991	0.2571

Results: shrub loading distribution by season and region